

JC12 Rec'd PCT/PTC 11 APR 2005

110087400US.ST25  
SEQUENCE LISTING

&lt;110&gt; Guss et al., Bengt

&lt;120&gt; Immunization of non-human mammals against Streptococcus equi

&lt;130&gt; 110087401 PC

&lt;150&gt; US 60/417,660

&lt;151&gt; 2002-10-11

&lt;160&gt; 27

&lt;170&gt; PatentIn version 3.1

&lt;210&gt; 1

&lt;211&gt; 180

&lt;212&gt; PRT

&lt;213&gt; Streptococcus equi

&lt;400&gt; 1

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20 25 30Asn Gln Glu Leu Gln Ala Val Leu Ala Asn Ala Gly Val Glu Ala Leu  
35 40 45Ala Ala Asp Thr Val Asp Gln Ala Lys Ala Ala Leu Asp Lys Ala Lys  
50 55 60Ala Ala Val Ala Gly Val Gln Leu Asp Glu Ala Arg Arg Glu Ala Tyr  
65 70 75 80Arg Thr Ile Asn Ala Leu Ser Asp Gln His Lys Ser Asp Gln Lys Val  
85 90 95Gln Leu Ala Leu Val Ala Ala Ala Ala Lys Val Ala Asp Ala Ala Ser  
100 105 110

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Val Asp Gln Val Asn Ala Ala Ile Asn Asp Ala His Thr Ala Ile Ala  
 115 120 125

Asp Ile Thr Gly Ala Ala Leu Leu Glu Ala Lys Glu Ala Ala Ile Asn  
 130 135 140

Glu Leu Lys Gln Tyr Gly Ile Ser Asp Tyr Tyr Val Thr Leu Ile Asn  
 145 150 155 160

Lys Ala Lys Thr Val Glu Gly Val Asn Ala Leu Lys Ala Lys Ile Leu  
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Ser Ala Leu Pro  
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<211> 597

<212> PRT

<213> Streptococcus equi

<400> 2

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 35 40 45

Tyr Phe Leu Tyr Val Ser Pro Lys Asn Ala Pro Lys Arg Glu Leu Lys  
 50 55 60

Asp Glu Tyr Val Val Tyr Cys Phe Asn Lys Lys Leu Tyr Trp Pro Asp  
 65 70 75 80

Gln Trp Glu Ser Ile Tyr Ser Asn Phe Asn Asp Ile Arg Ser Pro Tyr  
 85 90 95

Asn Asp Leu Pro Val Tyr Glu Lys Lys Leu Gly Tyr Asp Gly Ile Phe  
 100 105 110

Lys Gln Tyr Ala Pro Asp Tyr Lys Lys Asp Ile Ser Asp Ile Ala Ser  
 115 120 125

Ala Leu Val Ala Val Leu Ser Asn Gly Tyr Pro Thr Asn Lys Ser Gln  
 130 135 140

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Leu Ser Thr Ser Tyr His Leu Asn Asn Asp Ser Ser Arg Lys Val Thr  
 145 150 155 160  
 Gln Leu Ala Ile Trp Tyr Phe Ser Asp Ser Leu Thr Lys Glu Tyr Leu  
 165 170 175  
 Lys Asp Thr Gly Gly Tyr Asn Leu Asn Asp Met Glu Lys Lys Ala Leu  
 180 185 190  
 Asp Phe Leu Ile Ser Lys Gly Glu Asp Ser Lys Leu Lys Ser Glu Gln  
 195 200 205  
 Ser Asn Tyr Ser Leu Asp Ile Tyr Val Tyr Gln Ser Gly Gly His Asp  
 210 215 220  
 His Met Lys Asp Tyr Gln Asn Leu Leu Gly Ser Thr Leu Ile Pro Lys  
 225 230 235 240  
 Glu Pro Leu Lys Pro Gln Leu Gly Gly Phe Ser Gly His Asn Gly Asn  
 245 250 255  
 Gly Leu Ser Gly Leu Glu Gly Gly Ser Ser Gly Ser Gln Glu Thr Asn  
 260 265 270  
 Glu Asp Gly Lys Lys Gly Leu Ile Gly Phe His Gly Gly Leu Ser Gly  
 275 280 285  
 Ser Glu Gly Lys Arg Asp Pro Leu Pro Gly Leu Lys Gly Glu Ala Gly  
 290 295 300  
 Ala Pro Asp Thr Pro Gln Lys Pro Asn Asp Pro Leu Gln Gly Leu Glu  
 305 310 315 320  
 Gly Gly Asn Ser Pro Ile Val Glu Gln Asn Tyr Gly Ser Thr Glu Gly  
 325 330 335  
 Tyr His Gly Gln Ser Gly Ile Leu Glu Glu Thr Glu Asp Thr Asn Pro  
 340 345 350  
 Pro Gly Ile Ile Leu Gly Gly Ser Gly Asn Val Glu Thr His Glu Asp  
 355 360 365  
 Thr Arg Asn Pro His Leu Met Gly Ile Gly Gly Gly Leu Ala Gly Glu  
 370 375 380  
 Ser Gly Glu Thr Thr Pro Lys Pro Gly Gln Thr Gly Gly Gln Gly Pro  
 385 390 395 400  
 Val Ile Glu Thr Thr Glu Asp Thr Gln Lys Gly Met Ser Gly Gln Ser  
 405 410 415

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Gly Gly Thr Ile Glu Ser Glu Asn Thr Lys Lys Pro Glu Val Met Ile  
 420 425 430

Gly Gly Gln Gly Gln Thr Ile Glu Thr Thr Glu Asp Thr Gln Lys Gly  
 435 440 445

Met Ser Gly Gln Ser Gly Gly Thr Ile Glu Ser Glu Asp Thr Lys Lys  
 450 455 460

Pro Glu Val Met Ile Gly Gly Gln Gly Gln Ile Ile Asp Phe Ser Glu  
 465 470 475 480

Asn Thr Gln Ser Gly Met Ser Gly Gln Ser Gly Asp Thr Thr Val Ile  
 485 490 495

Glu Asp Thr Lys Lys Ser Glu Ile Ile Ile Gly Gly Gln Gly Gln Ile  
 500 505 510

Ile Asp Phe Ser Glu Asp Thr Gln Pro Gly Met Ser Gly Gln Ser Gly  
 515 520 525

Gly Thr Thr Ile Val Glu Asp Thr Lys Lys Pro Thr Pro Lys Pro Lys  
 530 535 540

Pro Ala Pro Ala Pro Ile Val Asn Asp Glu Lys Pro Asn Lys Gly Thr  
 545 550 555 560

His Leu Pro Gln Thr Ser Asp Met Lys Gln Leu Thr Leu Ser Ile Ile  
 565 570 575

Gly Ala Met Ser Met Leu Leu Val Leu Cys Leu Ser Leu Phe Lys Arg  
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Pro Ser Lys Lys Asp  
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<210> 3

<211> 371

<212> PRT

<213> Streptococcus equi

<400> 3

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 20 25 30

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Leu Val Phe Gly Gly Leu Leu Gly Ser Leu Gly Gly Ser Ser His Gln  
 35 40 45

Ala Arg Pro Lys Glu Gln Pro Val Ser Ser Ile Gly Asp Asp Asp Lys  
 50 55 60

Ser His Lys Ser Ser Ser Asp Ser Met Val Ser Arg Pro Pro Lys Lys  
 65 70 75 80

Asp Asn Leu Gln Pro Lys Pro Ser Asp Gln Pro Thr Asn His Gln His  
 85 90 95

Gln Ala Thr Ser Pro Ser Gln Pro Thr Ala Lys Ser Ser Gly His His  
 100 105 110

Gly Asn Gln Pro Gln Ser Leu Ser Val Asn Ser Gln Gly Asn Ser Ser  
 115 120 125

Gly Gln Ala Ser Glu Pro Gln Ala Ile Pro Asn Gln Gly Pro Ser Gln  
 130 135 140

Pro Leu Gly Leu Arg Gly Gly Asn Ser Ser Gly Ser Gly His His His  
 145 150 155 160

Gln Pro Gln Gly Lys Pro Gln His Leu Asp Leu Gly Lys Asp Asn Ser  
 165 170 175

Ser Pro Gln Pro Gln Pro Lys Pro Gln Gly Asn Ser Pro Lys Leu Pro  
 180 185 190

Glu Lys Gly Leu Asn Gly Glu Asn Gln Lys Glu Pro Glu Gln Gly Glu  
 195 200 205

Arg Gly Glu Ala Gly Pro Pro Leu Ser Gly Leu Ser Gly Asn Asn Gln  
 210 215 220

Gly Arg Pro Ser Leu Pro Gly Leu Asn Gly Glu Asn Gln Lys Glu Pro  
 225 230 235 240

Glu Gln Gly Glu Arg Gly Glu Ala Gly Pro Pro Ser Thr Pro Asn Leu  
 245 250 255

Glu Gly Asn Asn Arg Lys Asn Pro Leu Lys Gly Leu Asp Gly Glu Asn  
 260 265 270

Lys Pro Lys Glu Asp Leu Asp Gly Lys Gly Leu Ser Gly Glu Asn Asp  
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Glu Ser Pro Lys Leu Lys Asp Glu His Pro Tyr Asn His Gly Arg Arg  
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Asp Gly Tyr Arg Val Gly Tyr Glu Asp Gly Tyr Gly Gly Lys Lys His  
 305 310 315 320

Lys Gly Asp Tyr Pro Lys Arg Phe Asp Glu Ser Ser Pro Lys Glu Tyr  
 325 330 335

Asn Asp Tyr Ser Gln Gly Tyr Asn Asp Asn Tyr Gly Asn Gly Tyr Leu  
 340 345 350

Asp Gly Leu Ala Asp Arg Gly Gly Lys Arg Gly Tyr Gly Tyr Ser Tyr  
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Asn Pro Asp  
 370

<210> 4

<211> 657

<212> PRT

<213> Streptococcus equi

<400> 4

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Thr Leu Ser Ala Ser Leu His Lys Val Arg Ala Thr Asn Leu Ser Asp  
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Asn Ile Thr Ser Leu Thr Val Ala Ser Ser Ser Leu Arg Asp Gly Glu  
 35 40 45

Arg Thr Thr Val Lys Val Ala Phe Asp Asp Lys Lys Gln Lys Ile Lys  
 50 55 60

Ala Gly Asp Thr Ile Glu Val Thr Trp Pro Thr Ser Gly Asn Val Tyr  
 65 70 75 80

Ile Gln Gly Phe Asn Lys Thr Ile Pro Leu Asn Ile Arg Gly Val Asp  
 85 90 95

Val Gly Thr Leu Glu Val Thr Leu Asp Lys Ala Val Phe Thr Phe Asn  
 100 105 110

Gln Asn Ile Glu Thr Met His Asp Val Ser Gly Trp Gly Glu Phe Asp  
 115 120 125

Ile Thr Val Arg Asn Val Thr Gln Thr Thr Ala Glu Thr Ser Gly Thr  
 130 135 140

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Thr Thr Val Lys Val Gly Asn Arg Thr Ala Thr Ile Thr Val Thr Lys  
 145 150 155 160  
 Pro Glu Ala Gly Thr Gly Thr Ser Ser Phe Tyr Tyr Lys Thr Gly Asp  
 165 170 175  
 Met Gln Pro Asn Asp Thr Glu Arg Val Arg Trp Phe Leu Leu Ile Asn  
 180 185 190  
 Asn Asn Lys Glu Trp Val Ala Asn Thr Val Thr Val Glu Asp Asp Ile  
 195 200 205  
 Gln Gly Gly Gln Thr Leu Asp Met Ser Ser Phe Asp Ile Thr Val Ser  
 210 215 220  
 Gly Tyr Arg Asn Glu Arg Phe Val Gly Glu Asn Ala Leu Thr Glu Phe  
 225 230 235 240  
 His Thr Thr Phe Pro Asn Ser Val Ile Thr Ala Thr Asp Asn His Ile  
 245 250 255  
 Ser Val Arg Leu Asp Gln Tyr Asp Ala Ser Gln Asn Thr Val Asn Ile  
 260 265 270  
 Ala Tyr Lys Thr Lys Ile Thr Asp Phe Asp Gln Lys Glu Phe Ala Asn  
 275 280 285  
 Asn Ser Lys Ile Trp Tyr Gln Ile Leu Tyr Lys Asp Gln Val Ser Gly  
 290 295 300  
 Gln Glu Ser Asn His Gln Val Ala Asn Ile Asn Ala Asn Gly Gly Val  
 305 310 315 320  
 Asp Gly Ser Arg Tyr Thr Ser Phe Thr Val Lys Lys Ile Trp Asn Asp  
 325 330 335  
 Lys Glu Asn Gln Asp Gly Lys Arg Pro Lys Thr Ile Thr Val Gln Leu  
 340 345 350  
 Tyr Ala Asn Asp Gln Lys Val Asn Asp Lys Thr Ile Glu Leu Ser Asp  
 355 360 365  
 Thr Asn Ser Trp Gln Ala Ser Phe Gly Lys Leu Asp Lys Tyr Asp Ser  
 370 375 380  
 Gln Asn Gln Lys Ile Thr Tyr Ser Val Lys Glu Val Met Val Pro Val  
 385 390 395 400  
 Gly Tyr Gln Ser Gln Val Glu Gly Asp Ser Gly Val Gly Phe Thr Ile  
 405 410 415

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Thr Asn Thr Tyr Thr Pro Glu Val Ile Ser Ile Thr Gly Gln Lys Thr  
 420 425 430  
 Trp Asp Asp Arg Glu Asn Gln Asp Gly Lys Arg Pro Lys Glu Ile Thr  
 435 440 445  
 Val Arg Leu Leu Ala Asn Asp Ala Ala Thr Asp Lys Val Ala Thr Ala  
 450 455 460  
 Ser Glu Gln Thr Gly Trp Lys Tyr Thr Phe Thr Asn Leu Pro Lys Tyr  
 465 470 475 480  
 Lys Asp Gly Lys Gln Ile Thr Tyr Thr Ile Gln Glu Asp Pro Val Ala  
 485 490 495  
 Asp Tyr Thr Thr Thr Ile Gln Gly Phe Asp Ile Thr Asn His His Glu  
 500 505 510  
 Val Ala Leu Thr Ser Leu Lys Val Ile Lys Val Trp Asn Asp Lys Asp  
 515 520 525  
 Asp Tyr Tyr His Lys Arg Pro Lys Glu Ile Thr Ile Leu Leu Lys Ala  
 530 535 540  
 Asp Gly Lys Val Ile Arg Glu His Gln Met Thr Pro Asp Gln Gln Gly  
 545 550 555 560  
 Lys Trp Glu Tyr Thr Phe Asp Gln Leu Pro Val Tyr Gln Thr Gly Lys  
 565 570 575  
 Lys Ile Ser Tyr Ser Ile Glu Glu Lys Gln Val Ala Gly Tyr Gln Ala  
 580 585 590  
 Pro Val Tyr Glu Val Asp Glu Gly Leu Lys Gln Val Thr Val Thr Asn  
 595 600 605  
 Thr Leu Asn Pro Ser Tyr Lys Leu Pro Asp Thr Gly Gly Gln Gly Val  
 610 615 620  
 Lys Trp Tyr Leu Leu Ile Gly Gly Gly Phe Ile Ile Val Ala Ile Leu  
 625 630 635 640  
 Val Leu Ile Ser Leu Tyr Gln Lys His Lys Arg His Asn Met Ser Lys  
 645 650 655  
 Pro

&lt;210&gt; 5



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&lt;211&gt; 34

&lt;212&gt; DNA

&lt;213&gt; oligonucleotide primer

&lt;400&gt; 5

ttttctcgcg ctacggtaga gctgataaaa tctc

34

&lt;210&gt; 6

&lt;211&gt; 32

&lt;212&gt; DNA

&lt;213&gt; Oligonucleotide primer

&lt;400&gt; 6

tcagccatgg ctctagatgc tacaacggtg tt

32

&lt;210&gt; 7

&lt;211&gt; 600

&lt;212&gt; DNA

&lt;213&gt; Streptococcus equi

&lt;400&gt; 7

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tgactacgct gacaatcaag agcttcaggc tgttcttgct aatgctggag ttgaggcact	180
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tgggtgttcag cttgatgaag caagacgtga ggcttacaga acaatcaatg ccttaagtga	300
tcagcacaaa agcgatcaaa aggttcagct agctctagtt gctgcagcag ctaagggtggc	360
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ggacattaca ggagcagcct tgttgagggc taaagaagct gctatcaatg aactaaagca	480
gtatggcatt agtgattact atgtgacctt aatcaacaaa gccaaaactg ttgaagggtgt	540
caatgcgctt aaggcaaaga ttttatcagc tctaccgtag ctcgagcccg ggtgctttgc	600

&lt;210&gt; 8

&lt;211&gt; 30

&lt;212&gt; DNA

&lt;213&gt; Oligonucleotide primer

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<400> 8  
 ggtcccatgg caactccgaa tttagaagga

30

<210> 9

<211> 29

<212> DNA

<213> Oligonucleotide primer

<400> 9  
 cagactcgag gtcgggattg taagaatag

29

<210> 10

<211> 125

<212> PRT

<213> Streptococcus equi

<400> 10

Met Ala Thr Pro Asn Leu Glu Gly Asn Asn Arg Lys Asn Pro Leu Lys  
 1 5 10 15

Gly Leu Asp Gly Glu Asn Lys Pro Lys Glu Asp Leu Asp Gly Lys Gly  
 20 25 30

Leu Ser Gly Glu Asn Asp Glu Ser Pro Lys Leu Lys Asp Glu His Pro  
 35 40 45

Tyr Asn His Gly Arg Arg Asp Gly Tyr Arg Val Gly Tyr Glu Asp Gly  
 50 55 60

Tyr Gly Gly Lys Lys His Lys Gly Asp Tyr Pro Lys Arg Phe Asp Glu  
 65 70 75 80

Ser Ser Pro Lys Glu Tyr Asn Asp Tyr Ser Gln Gly Tyr Asn Asp Asn  
 85 90 95

Tyr Gly Asn Gly Tyr Leu Asp Gly Leu Ala Asp Arg Gly Gly Lys Arg  
 100 105 110

Gly Tyr Gly Tyr Ser Tyr Asn Pro Asp Leu Glu Pro Gly  
 115 120 125

<210> 11

<211> 34

<212> DNA

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&lt;213&gt; Oligonucleotide primer

&lt;400&gt; 11

accatggcta gcgcagagca gctttattat gggt

34

&lt;210&gt; 12

&lt;211&gt; 32

&lt;212&gt; DNA

&lt;213&gt; Oligonucleotide primer

&lt;400&gt; 12

atacccggga tacccttcgg tactaccata gt

32

&lt;210&gt; 13

&lt;211&gt; 310

&lt;212&gt; PRT

&lt;213&gt; Streptococcus equi

&lt;400&gt; 13

Met Ala Ser Ala Glu Gln Leu Tyr Tyr Gly Trp Asn Asp Gly Thr Arg  
1 5 10 15Gln Ser Ser Pro Tyr Phe Leu Tyr Val Ser Pro Lys Asn Ala Pro Lys  
20 25 30Arg Glu Leu Lys Asp Glu Tyr Val Val Tyr Cys Phe Asn Lys Lys Leu  
35 40 45Tyr Trp Pro Asp Gln Trp Glu Ser Ile Tyr Ser Asn Phe Asn Asp Ile  
50 55 60Arg Ser Pro Tyr Asn Asp Leu Pro Val Tyr Glu Lys Lys Leu Gly Tyr  
65 70 75 80Asp Gly Ile Phe Lys Gln Tyr Ala Pro Asp Tyr Lys Lys Asp Ile Ser  
85 90 95Asp Ile Ala Ser Ala Leu Val Ala Val Leu Ser Asn Gly Tyr Pro Thr  
100 105 110Asn Lys Ser Gln Leu Ser Thr Ser Tyr His Leu Asn Asn Asp Ser Ser  
115 120 125Arg Lys Val Thr Gln Leu Ala Ile Trp Tyr Phe Ser Asp Ser Leu Thr  
130 135 140

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Lys Glu Tyr Leu Lys Asp Thr Gly Gly Tyr Asn Leu Asn Asp Met Glu  
 145 150 155 160

Lys Lys Ala Leu Asp Phe Leu Ile Ser Lys Gly Glu Asp Ser Lys Leu  
 165 170 175

Lys Ser Glu Gln Ser Asn Tyr Ser Leu Asp Ile Tyr Val Tyr Gln Ser  
 180 185 190

Gly Gly His Asp His Met Lys Asp Tyr Gln Asn Leu Leu Gly Ser Thr  
 195 200 205

Leu Ile Pro Lys Glu Pro Leu Lys Pro Gln Leu Gly Gly Phe Ser Gly  
 210 215 220

His Asn Gly Asn Gly Leu Ser Gly Leu Glu Gly Gly Ser Ser Gly Ser  
 225 230 235 240

Gln Glu Thr Asn Glu Asp Gly Lys Lys Gly Leu Ile Gly Phe His Gly  
 245 250 255

Gly Leu Ser Gly Ser Glu Gly Lys Arg Asp Pro Leu Pro Gly Leu Lys  
 260 265 270

Gly Glu Ala Gly Ala Pro Asp Thr Pro Gln Lys Pro Asn Asp Pro Leu  
 275 280 285

Gln Gly Leu Glu Gly Gly Asn Ser Pro Ile Val Glu Gln Asn Tyr Gly  
 290 295 300

Ser Thr Glu Gly Tyr Gly  
 305 310

&lt;210&gt; 14

&lt;211&gt; 5

&lt;212&gt; PRT

&lt;213&gt; C-terminal motif

&lt;400&gt; 14

Leu Pro Asp Thr Gly  
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&lt;210&gt; 15

&lt;211&gt; 1971

&lt;212&gt; DNA

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&lt;213&gt; Streptococcus equi

&lt;400&gt; 15

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ggacaaggag tgaaatggta cctgttaatc ggtggcgggt ttatcatcgt cgcaatcctt	1920

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gtactgatca gcctttatca aaaacacaag cgccataaca tgtcaaaacc a 1971

<210> 16

<211> 32

<212> DNA

<213> Oligonucleotide primer

<400> 16  
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<210> 17

<211> 32

<212> DNA

<213> Oligonucleotide primer

<400> 17  
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<210> 18

<211> 32

<212> DNA

<213> Oligonucleotide primer

<400> 18  
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<210> 19

<211> 1782

<212> DNA

<213> Streptococcus equi

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aaggctgttt tcacattcaa tcaaaatatt gaaacaatgc atgatgtctc tggttgggga 300  
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&lt;210&gt; 20

&lt;211&gt; 594

&lt;212&gt; PRT

&lt;213&gt; Streptococcus equi

&lt;400&gt; 20

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Met Ala Thr Asn Leu Ser Asp Asn Ile Thr Ser Leu Thr Val Ala Ser
1           5           10          15

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Ser Ser Leu Arg Asp Gly Glu Arg Thr Thr Val Lys Val Ala Phe Asp
20          25          30

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Asp Lys Lys Gln Lys Ile Lys Ala Gly Asp Thr Ile Glu Val Thr Trp  
 35 40 45  
 Pro Thr Ser Gly Asn Val Tyr Ile Gln Gly Phe Asn Lys Thr Ile Pro  
 50 55 60  
 Leu Asn Ile Arg Gly Val Asp Val Gly Thr Leu Glu Val Thr Leu Asp  
 65 70 75 80  
 Lys Ala Val Phe Thr Phe Asn Gln Asn Ile Glu Thr Met His Asp Val  
 85 90 95  
 Ser Gly Trp Gly Glu Phe Asp Ile Thr Val Arg Asn Val Thr Gln Thr  
 100 105 110  
 Thr Ala Glu Thr Ser Gly Thr Thr Thr Val Lys Val Gly Asn Arg Thr  
 115 120 125  
 Ala Thr Ile Thr Val Thr Lys Pro Glu Ala Gly Thr Gly Thr Ser Ser  
 130 135 140  
 Phe Tyr Tyr Lys Thr Gly Asp Ile Gln Pro Asn Asp Thr Glu Arg Val  
 145 150 155 160  
 Arg Trp Phe Leu Leu Ile Asn Asn Asn Lys Glu Trp Val Ala Asn Thr  
 165 170 175  
 Val Thr Val Glu Asp Asp Ile Gln Gly Gly Gln Thr Leu Asp Met Ser  
 180 185 190  
 Ser Phe Asp Ile Thr Val Ser Gly Tyr Arg Asn Glu Arg Phe Val Gly  
 195 200 205  
 Glu Asn Ala Leu Thr Glu Phe His Thr Thr Phe Pro Asn Ser Val Ile  
 210 215 220  
 Thr Ala Thr Asp Asn His Ile Ser Val Arg Leu Asp Gln Tyr Asp Ala  
 225 230 235 240  
 Ser Gln Asn Thr Val Asn Ile Ala Tyr Lys Thr Lys Ile Thr Asp Phe  
 245 250 255  
 Asp Gln Lys Glu Phe Ala Asn Asn Ser Lys Ile Trp Tyr Gln Ile Leu  
 260 265 270  
 Tyr Lys Asp Gln Val Ser Gly Gln Glu Ser Asn His Gln Val Ala Asn  
 275 280 285  
 Ile Asn Ala Asn Gly Gly Val Asp Gly Ser Arg Tyr Thr Ser Phe Thr  
 290 295 300



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Val Lys Lys Ile Trp Asn Asp Lys Glu Asn Gln Asp Gly Lys Arg Pro  
 305 310 315 320  
 Lys Thr Ile Thr Val Gln Leu Tyr Ala Asn Asp Gln Lys Val Asn Asp  
 325 330 335  
 Lys Thr Ile Glu Leu Ser Asp Thr Asn Ser Trp Gln Ala Ser Phe Gly  
 340 345 350  
 Lys Leu Asp Lys Tyr Asp Ser Gln Asn Gln Lys Ile Thr Tyr Ser Val  
 355 360 365  
 Lys Glu Val Met Val Pro Val Gly Tyr Gln Ser Gln Val Glu Gly Asp  
 370 375 380  
 Ser Gly Val Gly Phe Thr Ile Thr Asn Thr Tyr Thr Pro Glu Val Ile  
 385 390 395 400  
 Ser Ile Thr Gly Gln Lys Thr Trp Asp Asp Arg Glu Asn Gln Asp Gly  
 405 410 415  
 Lys Arg Pro Lys Glu Ile Thr Val Arg Leu Leu Ala Asn Asp Ala Ala  
 420 425 430  
 Thr Asp Lys Val Ala Thr Ala Ser Glu Gln Thr Gly Trp Lys Tyr Thr  
 435 440 445  
 Phe Thr Asn Leu Pro Lys Tyr Lys Asp Gly Lys Gln Ile Thr Tyr Thr  
 450 455 460  
 Ile Gln Glu Asp Pro Val Ala Asp Tyr Thr Thr Thr Ile Gln Gly Phe  
 465 470 475 480  
 Asp Ile Thr Asn His His Glu Val Ala Leu Thr Ser Leu Lys Val Ile  
 485 490 495  
 Lys Val Trp Asn Asp Lys Asp Asp Tyr Tyr His Lys Arg Pro Lys Glu  
 500 505 510  
 Ile Thr Ile Leu Leu Lys Ala Asp Gly Lys Val Ile Arg Glu His Gln  
 515 520 525  
 Met Thr Pro Asp Gln Gln Gly Lys Trp Glu Tyr Thr Phe Asp Gln Leu  
 530 535 540  
 Pro Val Tyr Gln Ala Gly Lys Lys Ile Ser Tyr Ser Ile Glu Glu Lys  
 545 550 555 560  
 Gln Val Ala Gly Tyr Gln Ala Pro Val Tyr Glu Val Asp Glu Gly Leu  
 565 570 575

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Lys Gln Val Thr Val Thr Asn Thr Leu Asn Pro Ser Tyr Lys Leu Glu  
 580 585 590

Pro Gly

&lt;210&gt; 21

&lt;211&gt; 921

&lt;212&gt; DNA

&lt;213&gt; Streptococcus equi

<400> 21  
 atggcaacta atcttagtga caacatcaca tcattgacgg ttgcttcttc atcactccga 60  
 gatggagaga gaacgacggt aaagggtgcg ttgatgaca aaaaacagaa aatcaaggca 120  
 ggggatacga tagagggtcac ctggcctaca agtggtaatg tctacattca gggctttaat 180  
 aaaaccatac cgcttaatat tagaggggta gatgttggtta ccttgagggt cacgctagac 240  
 aaggctgttt tcacattcaa tcaaaatatt gaaacaatgc atgatgtctc tgggtgggga 300  
 gagtttgata ttactgttag aaatgtgaca caaaccaccg ctgaaacatc aggaacgacc 360  
 acagtaaagg taggcaatcg cactgctact atcactgtta ctaagcctga ggcaggcact 420  
 ggtaccagct cattttatta taagactggg gatatgcagc ccaatgatac tgagcgtgtg 480  
 agatggttcc tgctgattaa caacaacaag gaatgggtgg ccaatactgt tacagtcgaa 540  
 gacgatattc aagggtggtca aaccttggat atgagcagct ttgacatcac cgtatctggt 600  
 tatcgtaacg agcgcttcgt tggggaaaac gctctgacag agtttcatac aacatttcca 660  
 aattctgtca ttacggcaac agataatcac attagtgtgc ggtagatca atatgatgcc 720  
 tcacaaaaca ctgtcaacat tgcttataag acaaagataa cggactttga ccaaaaagaa 780  
 ttgccaaca acagtaaaat ctggtaccag attttataca aggatcaggt atcgggtcaa 840  
 gagtcaaacc accaagtagc caatatcaat gctaacggcg gggttgatgg cagtcgctat 900  
 accagctttc tcgagcccgg g 921

&lt;210&gt; 22

&lt;211&gt; 307

&lt;212&gt; PRT

&lt;213&gt; Streptococcus equi

&lt;400&gt; 22

Met Ala Thr Asn Leu Ser Asp Asn Ile Thr Ser Leu Thr Val Ala Ser  
 1 5 10 15

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Ser Ser Leu Arg Asp Gly Glu Arg Thr Thr Val Lys Val Ala Phe Asp  
 20 25 30  
 Asp Lys Lys Gln Lys Ile Lys Ala Gly Asp Thr Ile Glu Val Thr Trp  
 35 40 45  
 Pro Thr Ser Gly Asn Val Tyr Ile Gln Gly Phe Asn Lys Thr Ile Pro  
 50 55 60  
 Leu Asn Ile Arg Gly Val Asp Val Gly Thr Leu Glu Val Thr Leu Asp  
 65 70 75 80  
 Lys Ala Val Phe Thr Phe Asn Gln Asn Ile Glu Thr Met His Asp Val  
 85 90 95  
 Ser Gly Trp Gly Glu Phe Asp Ile Thr Val Arg Asn Val Thr Gln Thr  
 100 105 110  
 Thr Ala Glu Thr Ser Gly Thr Thr Thr Val Lys Val Gly Asn Arg Thr  
 115 120 125  
 Ala Thr Ile Thr Val Thr Lys Pro Glu Ala Gly Thr Gly Thr Ser Ser  
 130 135 140  
 Phe Tyr Tyr Lys Thr Gly Asp Met Gln Pro Asn Asp Thr Glu Arg Val  
 145 150 155 160  
 Arg Trp Phe Leu Leu Ile Asn Asn Asn Lys Glu Trp Val Ala Asn Thr  
 165 170 175  
 Val Thr Val Glu Asp Asp Ile Gln Gly Gly Gln Thr Leu Asp Met Ser  
 180 185 190  
 Ser Phe Asp Ile Thr Val Ser Gly Tyr Arg Asn Glu Arg Phe Val Gly  
 195 200 205  
 Glu Asn Ala Leu Thr Glu Phe His Thr Thr Phe Pro Asn Ser Val Ile  
 210 215 220  
 Thr Ala Thr Asp Asn His Ile Ser Val Arg Leu Asp Gln Tyr Asp Ala  
 225 230 235 240  
 Ser Gln Asn Thr Val Asn Ile Ala Tyr Lys Thr Lys Ile Thr Asp Phe  
 245 250 255  
 Asp Gln Lys Glu Phe Ala Asn Asn Ser Lys Ile Trp Tyr Gln Ile Leu  
 260 265 270  
 Tyr Lys Asp Gln Val Ser Gly Gln Glu Ser Asn His Gln Val Ala Asn  
 275 280 285

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Ile Asn Ala Asn Gly Gly Val Asp Gly Ser Arg Tyr Thr Ser Phe Leu  
 290 295 300

Glu Pro Gly  
 305

&lt;210&gt; 23

&lt;211&gt; 302

&lt;212&gt; PRT

&lt;213&gt; Streptococcus equi

&lt;400&gt; 23

Met Thr Asn Lys Thr Lys Arg Thr Gly Leu Val Arg Lys Tyr Gly Ala  
 1 5 10 15

Cys Ser Ala Ala Ile Ala Leu Ala Ala Leu Ala Ser Leu Gly Ala Gly  
 20 25 30

Lys Ala Val Lys Ala Asp Gln Pro Ala Ala Leu Lys Tyr Pro Glu Pro  
 35 40 45

Arg Asp Tyr Phe Leu His Thr Arg Glu Gly Asp Val Ile Tyr Asp Glu  
 50 55 60

Asp Ile Lys Arg Tyr Phe Glu Asp Leu Glu Ala Tyr Leu Thr Ala Arg  
 65 70 75 80

Leu Gly Gly Ile Asp Lys Lys Val Glu Glu Ala Ala Gln Lys Pro Gly  
 85 90 95

Ile Pro Gly Pro Thr Gly Pro Gln Gly Pro Lys Gly Asp Lys Gly Asp  
 100 105 110

Pro Gly Ala Pro Gly Glu Arg Gly Pro Ala Gly Pro Lys Gly Asp Thr  
 115 120 125

Gly Glu Ala Gly Pro Arg Gly Glu Gln Gly Pro Ala Gly Gln Ala Gly  
 130 135 140

Glu Arg Gly Pro Lys Gly Asp Pro Gly Ala Pro Gly Pro Lys Gly Glu  
 145 150 155 160

Lys Gly Asp Thr Gly Ala Val Gly Pro Lys Gly Glu Lys Gly Asp Thr  
 165 170 175

Gly Ala Thr Gly Pro Lys Gly Asp Lys Gly Glu Arg Gly Glu Lys Gly  
 180 185 190

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Glu Gln Gly Gln Arg Gly Glu Lys Gly Glu Gln Gly Gln Arg Gly Glu  
           195                                  200                                  205  
 Lys Gly Glu Gln Lys Pro Lys Gly Asp Gln Gly Lys Asp Thr Lys Pro  
       210                                  215                                  220  
 Ser Ala Pro Lys Ala Pro Glu Lys Ala Pro Ala Pro Lys Ala Pro Lys  
   225                                  230                                  235                                  240  
 Ala Ser Glu Gln Ser Ser Asn Pro Lys Ala Pro Ala Pro Lys Ser Ala  
                                   245                                  250                                  255  
 Pro Ser Lys Ser Ala Ala Pro Thr Gly Gln Lys Ala Ala Leu Pro Ala  
                                   260                                  265                                  270  
 Thr Gly Glu Ile Asn His Pro Phe Phe Thr Leu Ala Ala Leu Ser Val  
           275                                  280                                  285  
 Ile Ala Ser Val Gly Val Leu Thr Leu Lys Gly Lys Lys Asp  
       290                                  295                                  300

&lt;210&gt; 24

&lt;211&gt; 909

&lt;212&gt; DNA

&lt;213&gt; Streptococcus equi

&lt;400&gt; 24

atgacaaaca aaacaaagcg tacaggattg gtacgcaagt acggtgcctg ctcagcagct	60
atcgcccttag cagctcttgc aagcctggga gcaggtaaag cagtaaaggc agaccagcca	120
gcagcactaa aatatccaga acctagagac tattttcttc atactcgtga aggtgatgtt	180
atttatgatg aggatataaa aagatatattt gaggatttag aagcctattt aacagctaga	240
cttggtggga ttgataaaaa agtagaagaa gctgccccaa agccagggtat tccaggtcct	300
actggccctc aagggtcctaa gggagacaaa ggagatccag gtgcccctgg tgagcgcggt	360
ccagctggac caaagggcga tacgggcgaa gccggaccaa gaggtgagca aggcccagcc	420
ggacaagctg gagaacgtgg accaaaagga gatccagggtg ctccagggtcc taaaggtgaa	480
aaggggtgata ctggtgcagt tggtcctaaa ggtgaaaaag gtgataccgg agcaaccgga	540
ccaaagggag acaagggcga acgcggtgaa aaaggcgagc aaggccaacg tggcgaaaaa	600
ggcgagcaag gccaacgcgg tgaaaaaggc gagcaaaaac caaaggggtga tcaaggaaaa	660
gatacaaaac catcagctcc aaaagcacct gaaaaggctc ctgcaccaa agctccaaag	720
gcttcagagc agtcatctaa tcctaaagca ccagctccta agtcagcacc aagcaaatca	780
gcggcaccaa cagggtcaaaa agcagcccta ccagcaacag gggaaatcaa ccacccattc	840

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ttcacccttg cagctcttag tgtcatcgct agcgtaggcg tcctaactct aaaaggaaaa 900  
 aaagactaa 909

&lt;210&gt; 25

&lt;211&gt; 33

&lt;212&gt; DNA

&lt;213&gt; oligonucleotide primer

<400> 25 33  
 catgccatgg accagccagc agcactaaaa tat

&lt;210&gt; 26

&lt;211&gt; 31

&lt;212&gt; DNA

&lt;213&gt; oligonucleotide primer

<400> 26 31  
 ccgctcgagg gctgcttttt gacctgttg t

&lt;210&gt; 27

&lt;211&gt; 237

&lt;212&gt; PRT

&lt;213&gt; Streptococcus equi

&lt;400&gt; 27

Met Asp Gln Pro Ala Ala Leu Lys Tyr Pro Glu Pro Arg Asp Tyr Phe  
 1 5 10 15

Leu His Thr Arg Glu Gly Asp Val Ile Tyr Asp Glu Asp Ile Lys Arg  
 20 25 30

Tyr Phe Glu Asp Leu Glu Ala Tyr Leu Thr Ala Arg Leu Gly Gly Ile  
 35 40 45

Asp Lys Lys Val Glu Glu Ala Ala Gln Lys Pro Gly Ile Pro Gly Pro  
 50 55 60

Thr Gly Pro Gln Gly Pro Lys Gly Asp Lys Gly Asp Pro Gly Ala Pro  
 65 70 75 80

Gly Glu Arg Gly Pro Ala Gly Pro Lys Gly Asp Thr Gly Glu Ala Gly  
 85 90 95

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Pro Arg Gly Glu Gln Gly Pro Ala Gly Gln Ala Gly Glu Arg Gly Pro  
100 105 110

Lys Gly Asp Pro Gly Ala Pro Gly Pro Lys Gly Glu Lys Gly Asp Thr  
115 120 125

Gly Ala Val Gly Pro Lys Gly Glu Lys Gly Asp Thr Gly Ala Thr Gly  
130 135 140

Pro Lys Gly Asp Lys Gly Glu Arg Gly Glu Lys Gly Glu Gln Gly Gln  
145 150 155 160

Arg Gly Glu Lys Gly Glu Gln Gly Gln Arg Gly Glu Lys Gly Glu Gln  
165 170 175

Lys Pro Lys Gly Asp Gln Gly Lys Asp Thr Lys Pro Ser Ala Pro Lys  
180 185 190

Ala Pro Glu Lys Ala Pro Ala Pro Lys Ala Pro Lys Ala Ser Glu Gln  
195 200 205

Ser Ser Asn Pro Lys Ala Pro Ala Pro Lys Ser Ala Pro Ser Lys Ser  
210 215 220

Ala Ala Pro Thr Gly Gln Lys Ala Ala Leu Glu Pro Gly  
225 230 235